NOVA

ION

NOVA

Since the company was founded in 1989, NOVA has become one of the world's leading paraglider manufacturers with their head office in Terfens/Austria.

NOVA consists of a highly qualified team and most of the team members share the passion of flying with those pilots, who decided to fly a NOVA glider.

This passion and our Know-How are the fundamental parts of our work. By now, the passion and the Know-How are continuously growing. This is why we are for example pioneers in the area of air flow simulations, which allows us to predict certain properties of a new wing quite accurately on the computer.

Last but not least we have outstanding test pilots who provide a substantial contribution to make every new wing an unmistakable NOVA glider, which impresses in every aspect.

But NOVA doesn't only just stand for the development and the design of paragliders. We also want to take the responsibility for the manufacture of our gliders. That's why the production of NOVA-gliders takes place in our factory in the Hungarian town of Pecs. This allows us to influence important factors, for example quality assurance during the whole production process. Furthermore we can guarantee fair working conditions for about 100 NOVA-employees in Hungary.

We are convinced that the customer benefits from better employee working conditions, in terms of high-quality products.

What we want to achieve are happy and enthusiastic pilots, because the future of our sport depends on the enthusiasm of the people who are part of this wonderful sport.

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The ION

The ION is the result of permanent development and rigorous research which was based on the very successful ROOKIE. The ION is a Low-level EN B / LTF 1-2 paraglider which is suitable for beginners as well as experienced pilots in search of maximum safety and minimum stress.

Short technical description

The ION has 37 cells. Five of those cells are closed stabilo cells on each side.

There are four layers of lines. The first layer, the A-lines are red. B, C and D lines are yellow. The brake layer, which is not one of the four line layers, is orange. (the stabilo lines are orange as well.)

The risers consist of 5 belts. On the first two belts (red) both A stem lines are attached. Furthermore the speed system is fixed on the first A belt. On the next three belts the B, C, and D stem lines are attached.

Safety

The ION has a long brake travel until stall and soft collapse behaviour. In combination with the damped flight characteristics, the ION is suited for beginners. The EN / LTF test protocols show the very big safety margins of the glider. The ION is definitely not at the limit of its certification class. (EN B / LTF 1-2)

Handling Characteristics

We are especially proud of the balanced handling characteristics. Despite the large available brake travel, the ION can be piloted as precisely as is normally only possible with higher rated wings. So a beginner can "grow" perfectly with the ION and he will have the possibility to learn a lot more about flying than on a sluggish school-glider. A pilot who already has gathered solid experience will be able to use all the possibilities the wing offers right from the beginning.

Performance

We have improved the maximum speed, as well as the stability and the glide ratio in accelerated flight. So the ION is the perfect wing to gather experience in cross country flight.

The greatest strength of the ION lies in its impressive climbing performance. The wing can be turned very slow and tight, which allows the pilot to use small thermals efficiently. Thanks to the precise handling characteristics, it is easy to increase or decrease the amount of banking. The combination of efficient and relaxed thermalling is without equal.

New Features

- Split A-risers with magnet fixation
- Dirtholes on the stabilo
- Labelled risers for B-Stall and Ears
- New position and fixation of the brake pulleys for better ergonomics
- A vector band behind the cell openings maintains a very good shape of this important part of the wing.

Target Group

The ION aims to appeal to a wide range of pilots. On one side there are beginners, who are looking for a very safe and failure forgiving glider. Of course they want to avoid getting bored by their glider after some time.

On the other side there are pilots with a respectable amount of experience, who want sensitive handling characteristics combined with a big margin of safety.

Pilots requirements:

The ION is approved for schooling, so of course we don't make any demands on the pilot's skills, but we would like to remind every pilot of the importance of individual responsibility at this point.

Every pilot, who flies on their own has to be able to decide if their skills and equipment is adequate for the respective conditions. The ION offers superior safety but even on such a glider with maximum passive safety, misjudgements may have serious consequences.

The best way to avoid misjudgements is a defensive approach to the sport. Some times it makes sense to pass on a flight, instead of getting yourself into conditions you cannot handle. Regular training improves your skills and enables you to enjoy your flights, even in more difficult conditions.

Please consider these thoughts!

General information bevor implementing

First flight

Every NOVA glider has to be flown and checked through a NOVA dealer. This flight (date and pilot) has to be entered on the stabilo of the wing.

Registration

To get all warranty and service features, you have to register your glider on our Homepage. Please choose "LOGIN" and follow the advice for registration

Scope of delivery

The ION is shipped with a rucksack, an inner pack sack, a riserbag, the speed system, a windsock, the manual and a patch.

Modifications on the glider

Any modification (e.g. change of line lengths, changes on the speed system) causes a loss of certification. We recommend that you contact NOVA before performing any kind of change.

Suited harnesses

The ION is approved for any harness of the class "GH" (without diagonal bracing). This means almost every harness which is currently available.

The choice of the harness has a big influence on the flight characteristics of the ION. There are harnesses which allow very effective weight shifting on the one hand, but which tip to the side in turbulences quite undamped on the other hand.

Other harnesses don't allow extreme weight shifting, but they will give the pilot a calmer feel in turbulent conditions.

A good flying school can help on this topic with individual advice.

Weight range

Each size of the ION is certified for a certain weight range. The weight refers to the "overall take off weight". This means the weight of the pilot, the glider, the harness and all other equipment.

If you fly the ION on the lower half of the weight range, the agility decreases and the glider will be more damped. In strong turbulences the wing tends to deform and to collapse more than with a higher wing loading. If you mainly fly in weak conditions and you are not a fan of dynamic flight behaviour, you should consider flying the ION in this weight range.

If you fly the ION on the upper half of the weight range, the agility and the stability in turbulences will increase. Also the speed will increase slightly. The self damping will decrease in turns, as well as after collapses, so if you often plan to fly in bumpy conditions and you want a dynamic flight characteristic you should go for the top of the weight range.

Flying the ION

We suggest performing your first flights with a new wing in calm conditions to get used to the flight behaviour without any stress. We also recommend to do some take-offs on a training hill or some ground handling to get a good feeling for your glider from the very beginning.

Launch

Before every take off the pilot has to ensure that the equipment is in a proper condition, especially the glider, the harness and the reserve system.

Just before launch we recommend a check routine, which should be performed carefully. (Many accidents at take off could be avoided by a proper check!)

We recommend the following routine:

1.) Strapped up (Leg strap and chest strap on the harness and helmet strap all done up)

2.) Clipped in (Risers untwisted and connected to the karabiners, speed system attached and karabiners properly closed)

3.) Lines (A lines on top, all lines sorted, brake line unlooped between brake handle and pulley)

4.) Glider (glider lies arched with opened cell openings at take off.)

5.) Wind and airspace (wind suitable for launch and airspace in front of take off free of other gliders)

The ION has a very well balanced and easy take off behaviour. Corrections are easy to perform at any time and no special advice is needed for forward or reverse launches.

A proper take off technique can only be learnt by intensive training. That's why we recommend to spend some time on a training hill every once in a while. Also some ground handling will improve your take off skills. The best thing is to have an experienced pilot with you who can help with some advice.

Like this, you will soon be able to launch your glider confidently, even in difficult conditions. This will add a lot of safety to your flying and it allows you to enjoy your flights from the very beginning.

Normal flight

If you release both brakes ("Hands up") the ION glides at the so called "trim speed". At this speed, the glide ratio reaches its maximum.

If you fly into a headwind or through sinking air, you should use the accelerator to maximise your glide ratio. If you use the accelerator in turbulent conditions, you have to consider more demanding reactions in the case of a collapse. So you should keep more distance from the ground if you fly accelerated.

If you fly in strong turbulences we recommend applying both brakes slightly. This increases the stability and you get good feedback through the brakes, which is necessary to fly your wing actively.

Flying actively means permanent control and correction of the angle of attack in turbulent air. If you fly from lift into an area of sinking air, the angle of attack will decrease and the wing will pitch down. A good pilot will realise this even before the wing pitches down, by a reduced brake pressure. The right reaction would be to apply the brakes more and thereby increase brake pressure to prevent the wing from pitching down or even from collapsing in turbulent conditions.

Flying from sinking air into lift is just the opposite: Without any pilot action, the angle of attack would increase and the wing would pitch up. The pilot can feel this, by an increased brake pressure. In this situation, the pilot should release the brakes to reduce the pitch movement.

To generalize:

If the brake pressure decreases and if the wing pitches down, the pilot should apply more brakes. If the brake pressure increases and if the wing pitches up, the brakes should be released.

With proper active flight control, the pilot can avoid most of the collapses and keep control in every moment. The best way to learn this is of course flying, but ground handling definitely helps to improve the feeling for the glider. A good training exercise is to stabilise the wing above your head with the brakes, without looking at it. This helps as well for improving the forward launch.

Turning

A smooth turn is an interaction of inner brake, outer brake and weight shifting. The difficulty is finding the right amount, which is important if you want to climb efficiently in thermals.

The ION turns quite sensitively, so only small inputs are needed for performing precise turns. Tight and quick turns or fast changes of turning direction without unwanted pendulum movement are quite complex and take some training. It should be the goal of every pilot to master these skills perfectly.

Attention:

If you can't use the brakes for steering the glider you can use the D-risers instead. (This might be necessary for example, if the brake lines tangled up due to a bad pre-launch check or less likely, if the main brake line tears).

The ION can be turned quite well with the D-risers combined with weight shifting. You can also land the glider nice and smooth just with the D-risers. Don't pull the D-risers too much, to avoid a deep stall!

Landing

Landing the ION is very easy. In turbulent conditions we recommend applying brakes (approximately 20% of the available brake travel) during the whole approach. This will increase the stability of the glider and the feeling of the wing.

Just before touch down you should apply more brake. Many times it makes sense to induce a stall.

Attention:

A deep stall in just 2 meters height can cause a quite violent touch down. Make sure to not fully apply the brakes until you are close enough to the ground.

Manoeuvres for fast decent

Big ears

Big ears are very effective and easy to perform with the ION. For initiation, pull the outer A risers symmetrically. (They are labelled with "EARS") Keep the brake handles (without extra wraps) in your hands.

As long as you keep both outer A-risers pulled, the wingtips will be folded and the sink speed will increase. We recommend to additionally push the speed bar to increase the sink speed further and to also increase forward speed. The drag of the folded wingtips increases the angle of attack. By pushing the speed bar, this effect is compensated.

To end the manoeuvre, release the A-risers. If the wingtips don't open automatically, you can inflate them by applying the brakes with a short impulse movement.

B-Stall

You can enter a B-Stall by symmetrically pulling both B-risers approximately 20cm. The B-risers are labelled with "B-Stall". The force is quite high at the beginning, but decreases when you pull down further. To get a good hold of the risers, it makes sense to grab them on top at the shackles.

As you pull the risers down, the gliders stops its forward motion and after a pendulum swinging motion, the ION enters a very stable stall state. The sink rate depends on the wing loading and on how much the pilot pulls the B-risers. The maximum sink rate is about 9m/s.

If you pull too far, the glider starts to rotate about the yaw axis. In this case, release the risers, until the rotation stops. (Please note, that such a rotation can also be induced by an asymmetric pulling of both risers)

To exit the B-stall, raise up both hands speedily.

Keep the brake handles (without extra wraps) in your hands during the manoeuvre. Make sure to not apply brakes during the exit!

Deep spiral

The deep spiral is the most demanding of the three manoeuvres. (Ears, B-Stall and Deep Spiral) You should only practise it with a lot of altitude. The best way is to learn it under professional guidance.

Entering a deep spiral can be divided into two phases:
First, you fly a turn by applying one brake and by shifting your weight to the same side, the glider will bank up and increase its turning speed. This phase ends at a sink rate of roughly 8m/s – 10m/s. (depending on the wing loading)

Then at the beginning of the second phase the g-forces increase rapidly and the leading edge will lean towards the ground. In a fully developed deep spiral, the leading edge is almost parallel to the ground. The maximum sink rate with the ION can get up to 25m/s and more.

The first attempts to fly a deep spiral should be stopped clearly before reaching the second phase to get used to the quick rotation and to practice the exit without pendulum swinging. The exit should be performed by simply releasing the inner brake with a neutral weight-shift. The ION will then decrease its bank angle and go back to normal flight. To avoid a pendulum movement, the inner brake has to be pulled in the moment the wing wants to reduce its bank rapidly.

By applying the inner brake again, you force the glider to exit the spiral movement not rapidly but during two or three rotations. It is very important to master this exercise before continuing to the second phase of the deep spiral.

The pilot will feel the entering of this phase by the suddenly increased g-force. In this moment, the pilot is being pushed to the outer side of the harness. It is important to not counteract. So the pilot should lean to the outer side to avoid a stable spiral. (See below)

If the pilot weight shifts to the outer side, the spiral movement will get slower as soon as the pilot releases the inner brake. The rest of the exit works as explained above for the first phase of the deep spiral.

If the pilot shifts his weight clearly to the inner side, the ION might stay in a deep spiral, even when releasing both brakes. In this case, it helps to apply the outer brake, or both brakes and of course to shift the weight to the outer side.

Please don't underestimate the difficulty of learning the deep spiral. The sink rates are a lot higher than what you are used to from other manoeuvres and the fast rotation might lead to disorientation. The high g-loads of up to 3g make the manoeuvre even more demanding as you might have problems like the so called "black out", where you temporarily lose your vision due to the g-load. It is very important to get a feeling for the reactions of your body to this manoeuvre.

If you practice it well, it is a fun manoeuvre that enables you to loose height faster than with any other manoeuvre.

C-Stall

This manoeuvre can be found sporadically in some paragliding literature. We don't recommend it, because entering and exiting the C-stall can be very demanding and dangerous for many pilots.

Collapses

Asymmetric collapse

If you fly in strong turbulences, one side of the glider might collapse. This happens if one side of the wing doesn't produce lift anymore, due to a low angle of attack. If there is no lift, the lines get loose and the wing deforms or collapses.

Most of these collapses are rather small – they only affect a small part of the wingspan. In such a case, the ION continues to fly almost unaffected. If the collapse affects 50% of the wingspan or more, the wing will react considerably:

Due to the increased drag of the collapsed wing, the glider will turn to the collapsed side. Furthermore, the glider will pitch down because of the increased wing loading. (The glider has to increase its speed because of the reduced area – that's what causes the pitching down.)

The pilot can prevent the glider from pitching and turning, by applying the brake on the non collapsed side of the wing. If a collapse occurs close to the ground it is essential to react properly. The proper reaction should be taught at high altitude, ideally under professional guidance.

As explained above, most of the collapses can be prevented, if you fly actively!

Front tuck

A front tuck occurs, if the angle of attack gets too low on the whole wingspan, then the whole leading edge will collapse. After the asymmetric tuck, the ION will go back to normal flight automatically. The pilot can expedite the opening process by slightly applying both brakes.

Stall manoeuvres

Spin
If you pull one brake too much, you might induce a so called spin. The centre of rotation is no longer far outside the wing (like during a normal turn), but it moves inside the wing. Furthermore the rotation speed increases. The ION will go back to normal flight, if the pilot releases both brakes. The ION's spin behaviour is easily manageable: It takes a lot of brake travel to induce the spin, and then the pilot has quite some time to react and release both brakes.

Fullstall

If you pull both brakes too far, the wing will perform a so called full stall. The wing suddenly stops its forward motion, but the pilot is still moving forward. So from the pilots view, the glider will tilt backwards. It is very important to not release the brakes in this moment. Otherwise the glider might surge forward below the pilot.

The Full Stall is a complex manoeuvre and the perfect execution can not be explained in this manual. If you want to learn a proper full stall, it makes sense to do this under professional guidance.

The available brake travel before stalling the wing depends on the size. It is approximately 60cm for the ION 19, 63cm for the ION 21, 66cm for the ION 23, 70cm for the ION 25, and 73cm for the ION 27. Those numbers are just a rough indication. (The publication of the brake travel is claimed by the EN 926.)

It would be dangerous to use the brake travel according to those numbers, because it is not practicable to measure the brake travel during flight, and in turbulences the stall might occur with less brake travel. If you want to use the whole brake travel of your glider safely, it is necessary do many intended spins and full stalls to get a feeling for the stall behaviour.

Deep/Parachutal stall

The Deep Stall, or Parachutal Stall is kind of the pre stage to a Full Stall. The wing has no forward motion and a high sink speed, but it is almost fully inflated. The pilot can enter the Deep Stall by applying both brakes. It is very difficult to keep the wing in a Deep Stall: If you pull the brakes a little too much, the glider will enter a Full Stall. If you release the brakes too much, the glider will go back to normal flight. To practice a Deep Stall, it is necessary to master the Full Stall first.

A very old or worn out glider with a porous cloth or with a changed trim (due to many winch launches, or deep spirals) might stay in a deep stall even after releasing both brakes. Do not apply the brakes in such a situation, because the wing would then enter a full stall ! You can exit the deep stall by pushing the speed bar, or by simply pushing the A-risers forward. If you fly through rain, the risk of a deep stall is higher. We strongly advice against flying in rainy conditions. If it happens, that you get into rainfall, we recommend not performing a B-stall or Big Ears. Our recommendation is to leave the rain as soon as possible and to fly with both brakes released, or even accelerated, as this reduces the risk of a deep stall.

Cravates

After a big collapse or after a badly executed Full Stall, a part of the wing might be tangled up in the lines, and won’t reopen automatically. This is what

you call a cravate. During our extensive test flights with the ION we never experienced a cravate but this situation can not be eliminated with any paraglider.

In case of a cravate we recommend the following actions:

1.) Counter steer: Probably the wing wants to turn to the side of the cravate. In some cases, the turning happens quickly and will end in a stable deep spiral without the pilot's action. So it is important to react quickly by counter steering.

2.) Opening the cravate by applying the brake with an impulse movement: Some cravats can be opened with this method. It is important to keep the wing in straight flight by pulling the other brake all the time.

3.) Pulling the stabilo line: Some cravats can be opened by strongly pulling the stabilo line. (It is the orange line on the B-riser. Have a look at it or grab it every once in a while and you will be able to react quicker in a moment of danger.)

4.) Full stall: Many cravats can be opened by using the Full Stall. But of course you have to have solid experience with this manoeuvre to be able to use it properly.

5.) Reserve: If you loose control or if you are not absolutely sure that you have enough height for further attempts to recover, immediately use your reserve!

Many pilots wait way too long before using their reserve. Some don't use the reserve at all if they lose control of their glider. We strongly recommend to at least mentally practice the use of the reserve from time to time: Grab the handle of the reserve in flight, like you would do it in case of emergency. Many clubs or schools offer to throw the rescue for example in a gym. The most realistic way of training is to use the reserve in real flight. Many SIV Clinics offer that as part of their training.

Please use these possibilities: There are already too many pilots, who almost forgot that they have a reserve they could use, which is a very bad precondition to use it without hesitating in a dangerous moment.

Winch launch

The ION is very easy to launch on the winch. You should start to climb at a flat angle.

We recommend the use of a towing device which accelerates the glider during the winch launch.

Speed system

Mounting the speed system

Most harnesses have two pulleys on each side. Some light harnesses have simple rings instead. Guide the accelerator ropes (included in the delivery) from top to bottom through these pulleys. Then fix the speed bar on the bottom of the ropes.

It is important to adjust the length correctly. If you set it too short, the glider might fly accelerated all the time, which definitely has to be avoided. If you set it too long, you might not be able to use the full accelerator travel.

We suggest adjusting the length quite long and then try to estimate the free travel in flight to shorten it after the flight.

Using the accelerator in flight

If you push the speed travel all the way, the ION will gain approximately 12km/h speed. (Compared to "hands off"speed) It makes sense to use the accelerator when flying into a headwind or through sinking air – or simply to move forward faster.

Attention:
It doesn't make sense to apply the brakes during accelerated flight. This will reduce the glide performance considerably, and it will make the wing more unstable. (Unlike in non accelerated flight!)

To turn, simply shift weight, or push the speed bar asymmetrically. (If you push the right side further, the wing will perform a left turn.)

You can also use the accelerator for pitch control: If the glider pitches up, push the speed bar more, if it pitches down, release the speed bar.

Measurements of the speed systems (publication required by EN 926)

If you use all the available accelerator travel, the A & B risers will get shorter as follows:

19cm for the ION 25 & 27
16cm for the ION 21 & 23
14cm for the ION 19

The C riser reduces its length by exactly half of the value of the A&B riser. The D riser remains the same length.

Service and maintenance

General advice

To keep your glider in good condition for many years, please consider the following advice:

- Don't expose your glider to unnecessary UV radiation – for example by leaving it on the landing site unpacked.
- Don't fold the Mylar reinforcements at the cell openings too hard.
- If you pack the glider when it is wet or just damp, it has to be dried later. Don't leave it packed in a wet condition!
- When you practice ground handling, avoid crashing the glider hard on the ground with the leading edge, as this might lead to damage.
- Avoid unnecessary dirt or sharp stones touching the lines and the cloth. Don't step on the lines if they are laying on a stony surface!
- Humidity combined with dirt can lead to shrinking of the lines and thereby to the wrong trim on your glider. Saltwater (sweat) may damage the lines in the long run.
- To store your glider for a longer time, avoid a humid or a very hot environment. (Like in a car during hot summer days)

Cleaning

To clean the wing, only use water and a cleaning cloth. Never use any solvents. If there is sand, dirt or small stones inside the canopy, you should remove them because they will damage the coating of the cloth and the seams in the long run.

Repair

Repairs may only be performed by authorised service centres or by NOVA.

You can repair small holes or tears in the cloth (smaller than 5cm) yourself with a special self adhesive repair tape. (You can order it at NOVA or in any service centre.) If you are not sure about the damage, or if the damage affects parts of a seam, please contact NOVA. (info@nova-wings.com)

Check

We suggest a trim inspection (Nova Trim Tuning NTT) in the first year after the date of purchase. In the case that the NTT is done, the next full check (NFS: NOVA full service) has to be done 3 years after purchase. In the case that the NTT is not done, the wing needs a full check after 2 years. The check expert can define the next check interval on the basis of the wing's condition. In areas where conditions are harsh on the material (i.e. by salty air next to the coast), an annual complete check (NFS) is strongly recommended! The check has to be confirmed with the check-stamp on the stabilo. All necessary documents for the inspection can be found on the NOVA homepage (http://www.nova-wings.com): Downloads: Check.

More information about our check system: http://www.nova-wings.com/english/info_zone/ntt.html

Environment friendly behaviour:

Apart from self-evident things, like not leaving your rubbish behind, we would like to appeal for a thoughtful behaviour towards animals, like birds of prey or game animals. If you notice, that your fly by affects those animals (like causing a shortening reaction) please increase your distance.

Disposal:

Disused paragliders need a proper disposal. If you are not sure about the correct removal, please send your glider to NOVA.

Technical data

Size		19	21	23	25	27
Zoom factor		0.863	0.9073	0.95	0.99	1.0288
No. of cells				37		
Span proj.	m	8.23	8.65	9.06	9.44	9.81
Area proj.	m²	19	21	23	25	27
Aspect ratio proj.		3.57	3.57	3.57	3.57	3.57
Span	m	10.69	11.24	11.77	12.27	12.75
Area	m²	22.62	25	27.41	29.77	32.25
Aspect ratio		5.05	5.05	5.05	5.05	5.05
Line diameter	mm			1 / 1.4 / 1.85		
Line length	m	6.21	6.53	6.84	7.13	7.41
Line consumption	m	259	273	286	298	310
max. profile depth	m	2.61	2.74	2.85	2.99	3.09
min. profile depth	m	0.7	0.74	0.77	0.8	0.83
Weight	kg	4,9	5,3	5,8	6,1	6,4
Take-off weight LTF/EN[1]	kg	60-80	70-90	75-100	90-110	100-130
Places		1	1	1	1	1
Certification LTF		**1-2**	**1-2**	**1-2**	**1-2**	**1-2**
Certification EN		**B**	**B**	**B**	**B**	**B**

[1] Pilot + total equipment

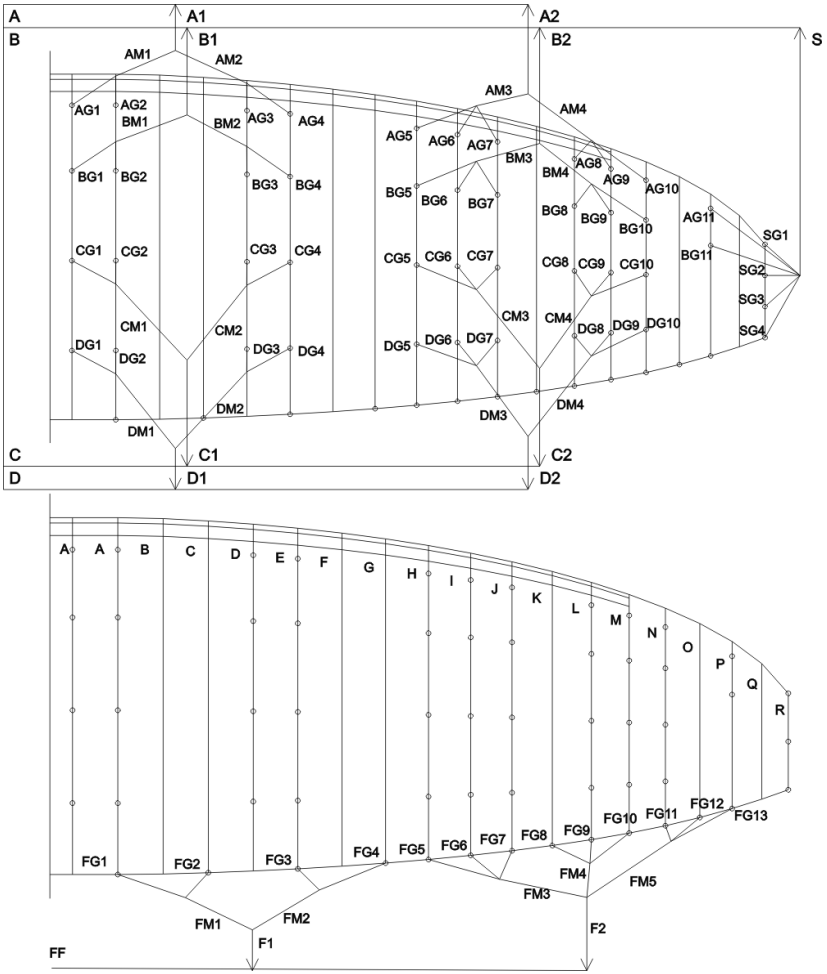
Overview risers

1	A1-Riser	6	Main supspension loop
2	A2-Riser (EARS)	7	Carabiner
3	B-Riser (B-Stall)	8	Brake handle
4	C-Riser	9	Speed clips
5	D-Riser	10	Shackle

Overview Glider

1 Stem Lines
2 Middle lines
3 Top Lines
4 Bottom sail
5 Cell Openings
6 Top sail
7 Trailing edge
8 Nameplate

Line plans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AM3
AM4
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FG6
FG7
FG8
FG9
FG10
FG11
FG12
FG13
FM1
FM2
FM3
FM4
FM5
F1
F2
FF

Line lengths:

	ION					Linetype
	19	21	23	25	27	
A1	262,5	277,1	290,6	302,2	313,8	Liros PPSL275 red
A2	334,6	354,7	369,7	385,4	401,8	Liros PPSL275 red
AM1	273,5	286,6	300,9	313,6	324,8	Liros PPSL160 red
AM2	267,8	281,2	295,6	308,3	319,8	Liros PPSL160 red
AM3	179	187,6	197,1	205,4	212,7	Liros PPSL160 red
AM4	180,1	189,1	198,8	207,5	215,3	Liros PPSL160 red
AG1	85,7	90	94,2	98,1	101,8	Liros DSL70 red
AG2	81,4	85,8	89,9	93,6	97,3	Liros DSL70 red
AG3	81,8	85,8	89,9	93,8	97,3	Liros DSL70 red
AG4	82,7	87	91,2	95,1	98,8	Liros DSL70 red
AG5	98,9	103,9	108,8	113,2	117,6	Liros DSL70 red
AG6	91	95,7	100,3	104,4	108,5	Liros DSL70 red
AG7	91,2	95,9	100,5	104,7	109	Liros DSL70 red
AG8	85,5	90	94,2	98,1	101,8	Liros DSL70 red
AG9	81,8	86	89,9	93,8	97,7	Liros DSL70 red
AG10	81,7	86	89,9	93,8	97,7	Liros DSL70 red
AG11	146,9	154,4	161,5	168,3	175,1	Liros DSL70 orange
B1	260,1	274	287,6	298,7	310	Liros PPSL275 yellow
B2	331,3	350,9	366,7	383,3	399	Liros PPSL275 yellow
BM1	273,4	286,8	300,1	313,1	324,7	Liros PPSL160 yellow
BM2	267,9	281,4	295,4	308,1	319,9	Liros PPSL160 yellow
BM3	178,7	187,4	196,5	204,7	212,2	Liros PPSL160 yellow
BM4	179,9	189	198,5	207,1	215	Liros PPSL160 yellow
BG1	85,6	90	94,2	98,1	101,8	Liros DSL70 yellow
BG2	81,4	85,7	89,9	93,6	97,3	Liros DSL70 yellow
BG3	81,8	85,9	89,9	93,6	97,3	Liros DSL70 yellow
BG4	82,7	87	91,2	95,1	98,8	Liros DSL70 yellow
BG5	98,6	103,6	108,4	112,9	117,2	Liros DSL70 yellow
BG6	91	95,7	100,3	104,4	108,5	Liros DSL70 yellow
BG7	91,2	96	100,5	104,7	109,1	Liros DSL70 yellow

BG8	85,6	90	94,2	98,1	101,8	Liros	DSL70 yellow
BG9	81,7	85,9	89,9	93,8	97,3	Liros	DSL70 yellow
BG10	80,9	85,1	89,2	93	96,8	Liros	DSL70 yellow
BG11	145,5	152,9	160,2	166,9	173,3	Liros	DSL70 orange
C1	263,8	277,5	291,2	303,6	314,8	Liros	PPSL275 yellow
C2	332,9	352	370,9	387,4	402,3	Liros	TSL280 yellow
CM1	273,5	287,3	300,5	313	325	Liros	PPSL160 yellow
CM2	267,7	281,7	295,2	307,7	319,9	Liros	PPSL160 yellow
CM3	179,2	188,1	196,8	205	212,8	Liros	PPSL120 yellow
CM4	178,7	188,1	197,1	205,5	213,7	Liros	PPSL120 yellow
CG1	85,7	90	94,2	98,1	101,8	Liros	DSL70 yellow
CG2	81,4	85,7	89,9	93,6	97,3	Liros	DSL70 yellow
CG3	81,8	86,1	89,9	93,8	97,3	Liros	DSL70 yellow
CG4	82,7	87	91,2	95,1	98,8	Liros	DSL70 yellow
CG5	98,6	103,6	108,4	112,9	117,2	Liros	DSL70 yellow
CG6	91	95,7	100,3	104,4	108,5	Liros	DSL70 yellow
CG7	91	95,7	100,3	104,7	108,8	Liros	DSL70 yellow
CG8	86,3	90,6	94,9	98,8	102,5	Liros	DSL70 yellow
CG9	81,5	85,7	89,9	93,6	97,3	Liros	DSL70 yellow
CG10	79,6	83,7	87,7	91,5	95,2	Liros	DSL70 yellow
D1	276,3	290,7	305,2	318,2	329,4	Liros	TSL280 yellow
D2	341	360,8	380,2	397,2	412	Liros	TSL280 yellow
DM1	273,9	287,7	300,9	313,3	325,5	Liros	PPSL120 yellow
DM2	267,4	281,3	294,9	307,4	319,5	Liros	PPSL120 yellow
DM3	180,7	189,7	198,4	206,5	214,6	Liros	PPSL120 yellow
DM4	176,5	185,7	195	203,3	211,1	Liros	PPSL120 yellow
DG1	85,7	90	94,2	98,1	101,8	Liros	DSL70 yellow
DG2	81,4	85,7	89,9	93,6	97,3	Liros	DSL70 yellow
DG3	81,9	86,1	89,9	93,8	97,3	Liros	DSL70 yellow
DG4	82,6	87	91,2	95,1	98,8	Liros	DSL70 yellow
DG5	99,1	104,1	108,8	113,4	117,8	Liros	DSL70 yellow
DG6	91,2	96	100,3	104,7	108,8	Liros	DSL70 yellow
DG7	90,4	95,1	99,8	104,4	108,1	Liros	DSL70 yellow
DG8	87,5	91,9	96,1	100,1	104	Liros	DSL70 yellow
DG9	81,3	85,7	89,9	93,6	96,8	Liros	DSL70 yellow
DG10	78	82,1	86,3	90	93,3	Liros	DSL70 yellow

S	406,9	429,5	451,2	473,4	491,4	Liros	PPSL160 orange
SG1	115,3	121,4	127,2	132,7	137,9	Liros	DSL70 orange
SG2	118,4	124,6	130,6	136,2	141,5	Liros	DSL70 orange
SG3	125,7	132,2	138,6	144,5	150,2	Liros	DSL70 orange
SG4	136,2	143,3	150,2	156,6	162,7	Liros	DSL70 orange
FF	161	169	176	182	191	Edelrid	7850-360 orange
F1	295,1	310,5	326,3	338,8	351,9	Liros	DSL70 orange
F2	258,3	272,6	288,1	300,1	311,2	Liros	DSL70 orange
FM1	112,8	118,4	123,6	128,6	133,7	Liros	DSL70 orange
FM2	100,1	105,5	111	115,8	120,3	Liros	DSL70 orange
FM3	159,8	167,8	175,6	182,4	189,6	Liros	DSL70 orange
FM4	145,6	153,1	160,8	167,5	173,6	Liros	DSL70 orange
FM5	145,5	153,2	160,7	168	174,6	Liros	DSL70 orange
FG1	144,2	150	155	160,1	165,6	Liros	DSL70 orange
FG2	113,1	118	122,2	126,7	131,4	Liros	DSL70 orange
FG3	105,3	110,2	114,3	118,7	123,6	Liros	DSL70 orange
FG4	99,8	105,1	110,5	115,3	119,8	Liros	DSL70 orange
FG5	77,6	81,3	84,4	87,7	91,6	Liros	DSL70 orange
FG6	61,1	64,2	67,2	70	72,8	Liros	DSL70 orange
FG7	58,9	62	65,1	68	70,5	Liros	DSL70 orange
FG8	65,9	69,2	72,3	75,2	78,2	Liros	DSL70 orange
FG9	56,9	59,8	62,6	65,3	68	Liros	DSL70 orange
FG10	56,8	59,7	63,1	65,8	67,9	Liros	DSL70 orange
FG11	49,7	52,2	55,4	57,4	58,9	Liros	DSL70 orange
FG12	45,1	47,2	48,8	50,7	53,2	Liros	DSL70 orange
FG13	47,6	49,8	50,9	53,1	56,1	Liros	DSL70 orange

Over all line lengths:

You can find the overall line lengths (from the shackle to the loops on the bottom sail) on the homepage of the Para-Academy. (www.para-academy.eu) Please note, that you can not calculate the over all length, by just adding the single line lengths listed above!